KPMG

Transforming for a water-secure future

Resilience, circularity, and technology in focus

Key insights from Singapore International Water Week 2024

KPMG in Singapore

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Foreword

In the face of an intensifying global water crisis, exacerbated by climate change, the water sector confronts unprecedented challenges and opportunities. Addressing these challenges requires a transformative approach, integrating resilience, circularity, and advanced technology to ensure a water-secure future. Central to this would be the need to accelerate innovative solutions in a resource-constrained world, while shoring up climate resilience.

This whitepaper delves into these themes, highlighting key strategies and solutions discussed at the Singapore International Water Week (SIWW) 2024. In particular, climate adaptation was highlighted as a new pillar at this year's event, with greater emphasis around coastal protection and flood management. This topic is particularly pertinent for Singapore, which is susceptible to extreme storm surges and rising sea levels.

In her opening address at SIWW 2024, Minister for Sustainability and the Environment Grace Fu emphasised the need to foster partnerships and platforms for collaboration to address these risks. But beyond bringing the best minds together, there was also a call for stakeholders – from public agencies, business and industry groups and researchers – to tap the potential of emerging technologies for efficiency and scalability. For instance, smart water grids and technologies like Artificial Intelligence (AI) can be leveraged for real-time monitoring to enhance water quality and distribution, while reducing wastage.

As Singapore takes decisive strides towards a water-secure future, prioritising resilience, circularity and technology will have to be the driving force behind our collective efforts to tackle the complex yet diverse water challenges of today.

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Digitalising water for sustainability

The water sector is progressively deploying advanced technologies to meet its evolving needs. The rising use of smart water grids ensures the quality of water is preserved with minimal disruptions. Despite this progress, sustainability reporting in the water utilities sector remains limited, especially concerning Scope 1 and 2 emissions, underscoring the need for more comprehensive instrumentation and data collection.

Current trends indicate a significant shift towards digitalisation within the water sector. Smart water grids, which utilise sensors and real-time monitoring systems, are becoming integral to modern water infrastructure. These grids enable precise detection of leaks, optimise water distribution, and enhance the overall efficiency of water management systems. Furthermore, the integration of AI and machine learning algorithms is revolutionising predictive maintenance and operational decision-making processes.

Utilities are increasingly adopting cloud-based platforms for data management and analytics, facilitating better resource allocation and strategic planning. The convergence of these technologies not only improves operational efficiency but also supports sustainability goals by reducing water wastage and energy consumption. The trend towards digitalisation is thus essential for building resilient water systems capable of adapting to future challenges. Building technological capacities through digitalisation, AI and machine learning will significantly benefit the sector. Enhanced instrumentation and the anticipated influx of field data, will refine decision-making, streamline operations, promote sustainability and unlock new business opportunities.

- Emerging technologies such as AI and machine learning are transforming water management by enabling more sophisticated and proactive approaches. For instance, AI-driven predictive analytics can anticipate equipment failures, thereby minimising downtime and maintenance costs. A hypothetical scenario: A water utility equipped with AI-powered leak detection could identify potential leaks before they become critical, thus preventing water loss and reducing repair costs.
- Machine learning algorithms can optimise water treatment processes by analysing vast datasets to determine the most efficient chemical dosages and filtration methods. In another scenario, machine learning models could predict seasonal variations in water demand, allowing utilities to adjust supply schedules accordingly and avoid shortages or overproduction.

However, these technologies also present challenges, including the need for significant initial investments and the complexity of integrating new systems with existing infrastructure. Additionally, there is a growing concern about data privacy and security, particularly in the context of IoT-enabled devices that continuously collect and transmit data. Addressing these challenges requires a robust framework for technology adoption, encompassing regulatory compliance, cybersecurity measures, and ongoing workforce training.

Embracing water circularity

A central theme at SIWW 2024 was the transition to a circular water economy. Viewing water as a carrier of valuable materials, rather than just a consumable resource, is crucial for achieving net-zero goals and transforming water suppliers into stewards of liveability. This shift also highlights the urgent need to address water loss and wastage.

Consider a hypothetical scenario in which a mid-sized city adopts a circular water economy. The city's water treatment plants are retrofitted with advanced filtration systems capable not only of purifying water but also of extracting valuable by-products such as phosphorus and nitrogen, which can be repurposed as agricultural fertilisers. Smart sensors and AI-driven analytics are employed to monitor water usage in real-time, optimising distribution and reducing waste. As a result, the city experiences a 30 percent reduction in water consumption and a 20 percent decrease in operational costs. The reclaimed materials provide an additional revenue stream, contributing to the local economy and enhancing food security.

In another scenario, a coastal city facing freshwater scarcity implements a comprehensive water recycling programme. Wastewater is treated using cutting-edge membrane technologies and reused for industrial processes, landscaping, and even potable water. This initiative leads to a substantial reduction in freshwater extraction from natural sources, preserving local ecosystems and ensuring a sustainable water supply for future generations. The economic benefits include reduced dependency on expensive desalination processes and lower energy consumption, reinforcing the city's resilience against climate change impacts.

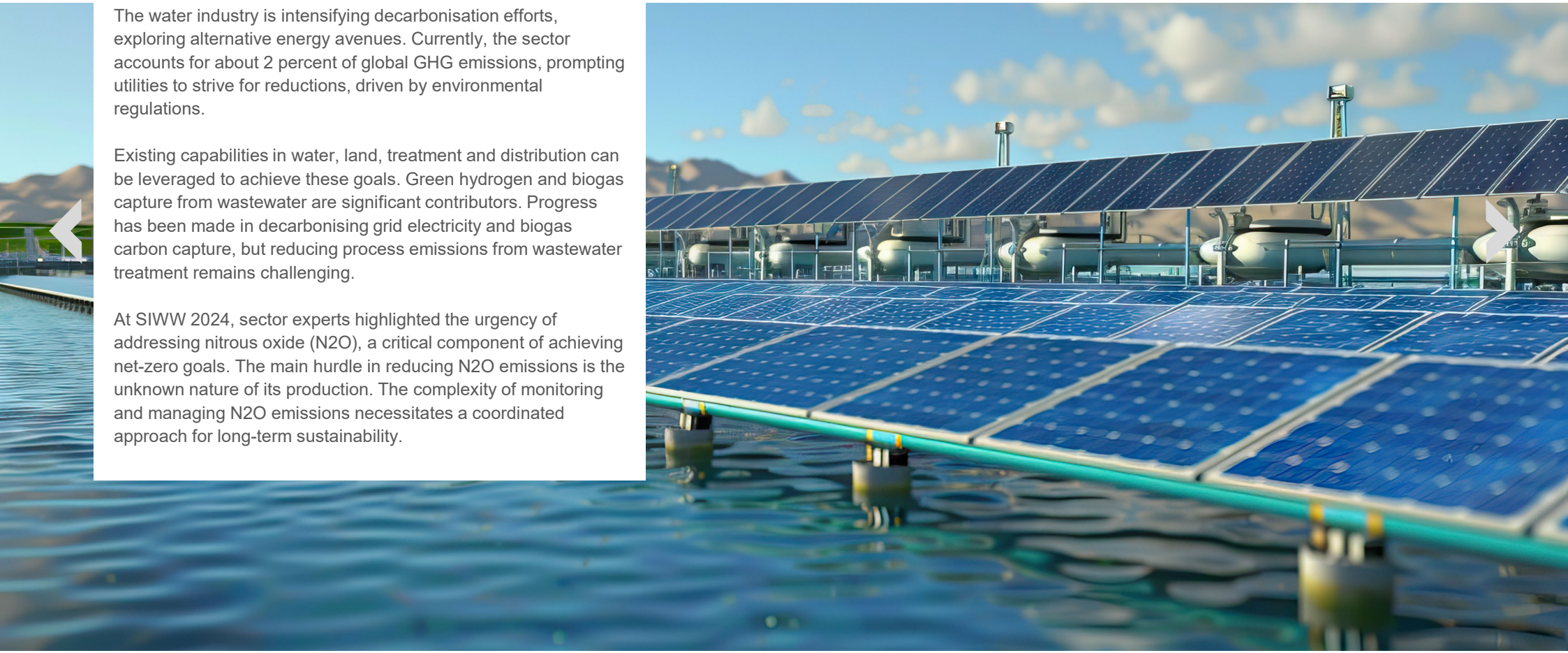
Technological advancements, particularly in AI and data analytics, are key in reducing water losses and enhancing efficiency. While positive trends are emerging, organisations must integrate new water technologies with existing infrastructure, increase stakeholder engagement through standardised indicators and policies, and shift from traditional cost-benefit models to circular value chains. Though initial investments may be high, the long-term benefits far outweigh the costs.

Decarbonising water

The water industry is intensifying decarbonisation efforts, exploring alternative energy avenues. Currently, the sector accounts for about 2 percent of global GHG emissions, prompting utilities to strive for reductions, driven by environmental regulations.

Existing capabilities in water, land, treatment and distribution can be leveraged to achieve these goals. Green hydrogen and biogas capture from wastewater are significant contributors. Progress has been made in decarbonising grid electricity and biogas carbon capture, but reducing process emissions from wastewater treatment remains challenging.

At SIWW 2024, sector experts highlighted the urgency of addressing nitrous oxide (N2O), a critical component of achieving net-zero goals. The main hurdle in reducing N2O emissions is the unknown nature of its production. The complexity of monitoring and managing N2O emissions necessitates a coordinated approach for long-term sustainability.



Partnering for climate adaption

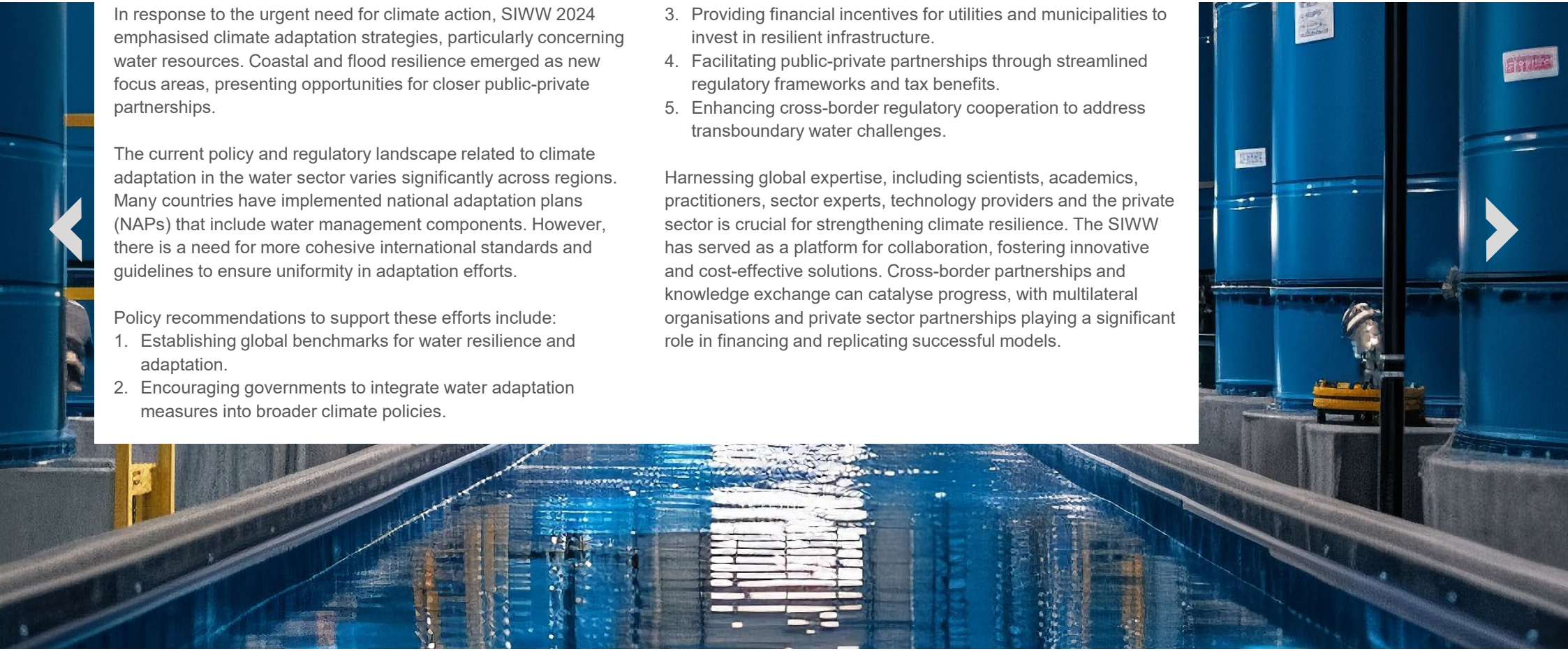
In response to the urgent need for climate action, SIWW 2024 emphasised climate adaptation strategies, particularly concerning water resources. Coastal and flood resilience emerged as new focus areas, presenting opportunities for closer public-private partnerships.

The current policy and regulatory landscape related to climate adaptation in the water sector varies significantly across regions. Many countries have implemented national adaptation plans (NAPs) that include water management components. However, there is a need for more cohesive international standards and guidelines to ensure uniformity in adaptation efforts.

Policy recommendations to support these efforts include:

1. Establishing global benchmarks for water resilience and adaptation.
2. Encouraging governments to integrate water adaptation measures into broader climate policies.
3. Providing financial incentives for utilities and municipalities to invest in resilient infrastructure.
4. Facilitating public-private partnerships through streamlined regulatory frameworks and tax benefits.
5. Enhancing cross-border regulatory cooperation to address transboundary water challenges.

Harnessing global expertise, including scientists, academics, practitioners, sector experts, technology providers and the private sector is crucial for strengthening climate resilience. The SIWW has served as a platform for collaboration, fostering innovative and cost-effective solutions. Cross-border partnerships and knowledge exchange can catalyse progress, with multilateral organisations and private sector partnerships playing a significant role in financing and replicating successful models.



Key stakeholders in climate adaptation efforts include:

1. **Government agencies:** Responsible for policymaking, regulatory enforcement, and funding of adaptation projects. They play a critical role in setting the strategic direction and creating an enabling environment for adaptation initiatives.
2. **Utilities and water management authorities:** Directly involved in implementing adaptation measures, such as infrastructure upgrades and operational changes to enhance resilience against climate impacts.
3. **Private sector companies:** Including technology providers, engineering firms, and financial institutions that offer innovative solutions and funding mechanisms for adaptation projects.
4. **Research institutions and academia:** Contribute through research, development of new technologies, and providing evidence-based recommendations for effective adaptation strategies.
5. **Non-Governmental Organisations (NGOs):** Advocate for sustainable practices, community engagement, and often act as intermediaries between governments, businesses, and local communities.
6. **Local communities:** Their involvement is essential for the successful implementation and sustainability of adaptation measures. Community-based approaches ensure that local knowledge and needs are integrated into adaptation planning and execution.

By leveraging the strengths and expertise of these stakeholders, climate adaptation efforts can be more coordinated, comprehensive, and impactful. The collective action of these diverse groups will be pivotal in building resilient water systems capable of withstanding the adverse effects of climate change.

Building resilient coastal cities

Coastal cities are facing their most vulnerable predicament due to severe climate-induced challenges, water scarcity, loss of natural environment, rising sea levels and frequent storms and floods. Coastal pollution has also emerged as a critical challenge to contend.

Against this backdrop, there is a need for senior officials, regulators and industry leaders to come together to pursue an integrated water management strategy for creating liveable and resilient coastal cities. These could include sharing of best practices and knowledge on how to protect urban communities against the impacts increasing coastal and inland flood risks, while enhancing their overall quality of life. Additionally, urban and system planners can also develop a deeper understanding of water metabolisms and potential future scenarios to be able to design more resilient water infrastructures in coastal cities.

Building coastal resilience is a core part of Singapore's whole-of-nation effort to advance its sustainable development agenda through the Singapore Green Plan 2030. Hence, at the SIWW 2024, Minister for Sustainability and the Environment Grace Fu also made the call for closer partnerships between the public and private sectors in addressing coastal and flood risks. She also highlighted the potential of technology in creating innovative, future-ready solutions.

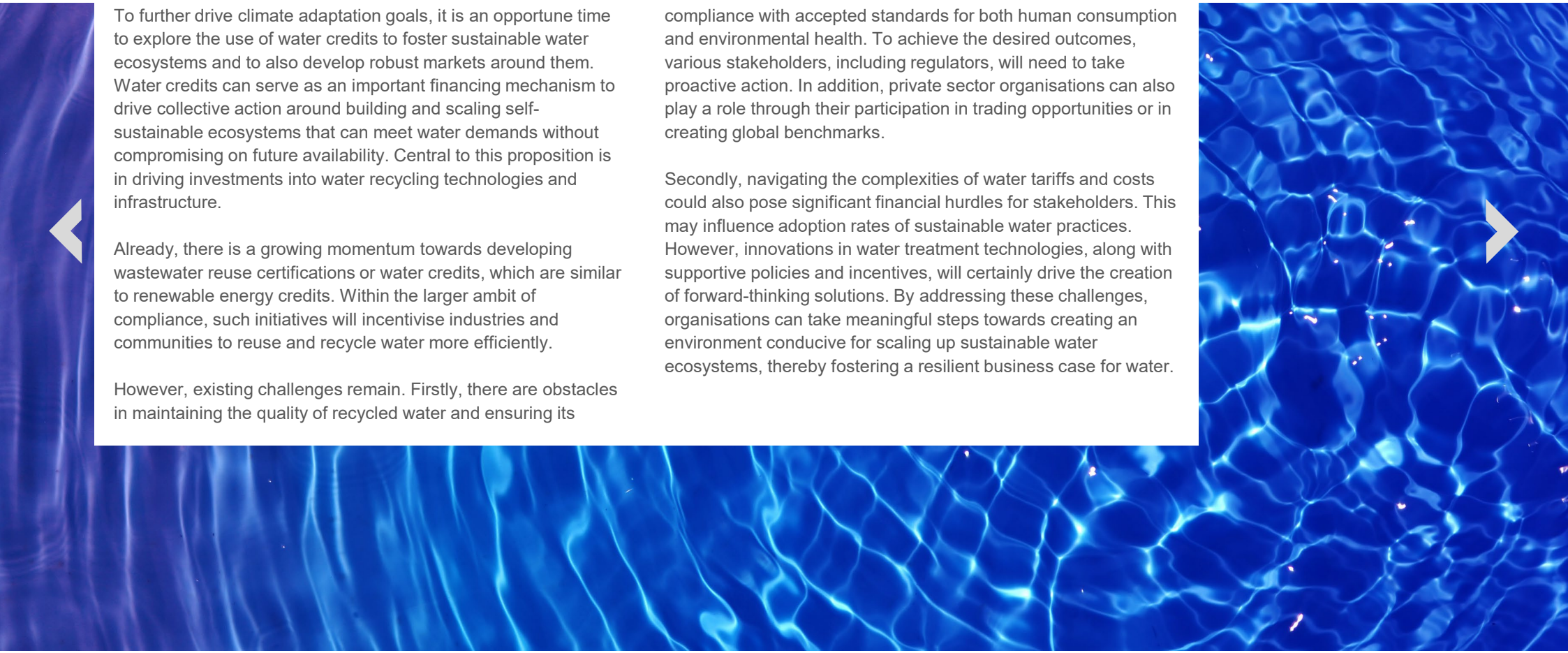
Water credits: A business case for water

To further drive climate adaptation goals, it is an opportune time to explore the use of water credits to foster sustainable water ecosystems and to also develop robust markets around them. Water credits can serve as an important financing mechanism to drive collective action around building and scaling self-sustainable ecosystems that can meet water demands without compromising on future availability. Central to this proposition is in driving investments into water recycling technologies and infrastructure.

Already, there is a growing momentum towards developing wastewater reuse certifications or water credits, which are similar to renewable energy credits. Within the larger ambit of compliance, such initiatives will incentivise industries and communities to reuse and recycle water more efficiently.

However, existing challenges remain. Firstly, there are obstacles in maintaining the quality of recycled water and ensuring its compliance with accepted standards for both human consumption and environmental health. To achieve the desired outcomes, various stakeholders, including regulators, will need to take proactive action. In addition, private sector organisations can also play a role through their participation in trading opportunities or in creating global benchmarks.

Secondly, navigating the complexities of water tariffs and costs could also pose significant financial hurdles for stakeholders. This may influence adoption rates of sustainable water practices. However, innovations in water treatment technologies, along with supportive policies and incentives, will certainly drive the creation of forward-thinking solutions. By addressing these challenges, organisations can take meaningful steps towards creating an environment conducive for scaling up sustainable water ecosystems, thereby fostering a resilient business case for water.



How can KPMG help?

The water sector presents new opportunities and challenges for organisations, amid a growing need for more investment in potable water as well as industrial and irrigation supply. This comes as the looming global water crisis is being exacerbated by the impacts of climate change. Natural water sources, including both ground and surface water, are being depleted and degraded. It has also become increasingly challenging to ensure the adequate flow of financial resources to the water sector, while striking a balance between affordability and financial sustainability. In this era of unprecedented environmental challenges, the role of water utilities is becoming more critical than ever.

KPMG is well positioned to partner with you in your journey towards creating smart and sustainable utilities by leveraging technological and financing innovation. We can work with you to explore how cutting-edge innovations in policy, regulations, environmental practices, technology, and financing can drive both affordability and financial sustainability. These will contribute towards addressing issues that are top of mind for the sector, such as resource diversification, water quality, energy optimisation, risk management, and ESG considerations.

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